

SERVICE PROVIDING SYSTEM

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## BACKGROUND OF THE INVENTION

### Field of the Invention

The present invention relates to a system which can provide electronic settlements and services through wireless communications.

Generally, for providing a service based on a paid price, a service provider needs to confirm whether or not a price has been paid for the service, i.e., whether or not the payment has been settled. For example, a service provider may confirm a ticket which certifies that a price has been paid by means of a ticket examiner for managing the admission to a site where a certain service is provided. An automatic vending machine, in turn, confirms a price with money introduced therinto.

In the following, a conventional ticket examiner will be described.

A conventional ticket examiner 100 illustrated in Fig. 9 comprises a magnetic head 2; a printer 3; a slot and paper handler 41; a paper handler and pickup port 42; a collector box 5; a controller 6; an optical sensor based light receiver 7; a light source 71; and motor driven gates 81, 82. The ticket examiner 100 is used not only at entrances to means of communication but also at entrances/exits of concert

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In the meantime, the spectator passes through

the motor driven gate 81 to interrupt the optical sensor 7. The ticket examiner 100 closes the motor driven gate 82 at this time, but does not close the gate if the ticket is determined as valid. If the  
5 ticket is not valid, the ticket examiner 100 continuously generates an alarm, with the gate closed, to notify the spectator and surroundings that the ticket is not valid.

#### SUMMARY OF THE INVENTION

10 The conventional ticket examiner requires a spectator, when he passes therethrough for admission, to introduce as a ticket a slip applied with a magnetic tape adhered on the back surface thereof or a slip dedicated to the ticket examiner. Thus, even when a  
15 spectator uses a so-called electronic ticket which has been electronically stored in a mobile terminal such as a mobile telephone or the like, among other tickets purchased through electronic settlements via the Internet or the mobile telephone, the spectator must go  
20 through the issuance of a ticket of paper from the electronic ticket before admission, and then introduce the issued ticket into the ticket examiner for admission.

The requirement to such a sequence is not  
25 limited only to the ticket examiner but is common to other systems for use in providing other services. In other words, even if a person who is going to receive a

service has information which guarantees an electronic price such as electronic money or an electronic ticket or the like, he must once convert the information to a physical entity, for example, a ticket, coin, bill or  
5 the like when he is going to receive a service through a system which is not capable of directly receiving the electronic money and so on, such as a vending machine and a ticket examiner.

As such, since the conversion is time  
10 consuming, the person who is going to receive the service must wait for a long time required for the conversion.

It is therefore an object of the present invention to simply and reliably provide a service to a  
15 user, who should receive the service using an electronic ticket or the like stored in a mobile terminal or the like.

To achieve the above object, the present invention provides a system for providing a service  
20 which includes a mobile terminal that stores electronic tickets or the like, and an apparatus for receiving a compensation such as an electronic ticket or information for guaranteeing the compensation. For example, a wireless non-contact communication means is  
25 provided in each of the mobile terminal and the apparatus, such that the electronic ticket or the like is transferred therebetween for confirmation through the communication means to provide an actual service.

Also, in the present invention, the electronic ticket is transferred between a mobile terminal and a ticket examiner through a non-contact communication means such as wireless communication means provided in each of the mobile terminal and the ticket examiner. The ticket examiner comprises means for storing magnetized slips, magnetized roll paper, plastic strips or slips, and shaping means for cutting the magnetized slip or the like into a proper size.

10 The ticket examiner may be configured to confirm the validity of the electronic ticket before issuing a ticket.

The apparatus for confirming the compensation may be an automatic vending machine or an automatic ticket vending machine.

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#### BRIEF DESCRIPTION OF THE DRAWING

Fig. 1 is a block diagram illustrating a ticket examiner according to a first embodiment of the present invention;

20 Fig. 2 illustrates an outer appearance of the ticket examiner in the first embodiment;

Fig. 3 shows wave accessible/audible ranges in the first embodiment;

Fig. 4 shows a relationship between the wave accessible/audible range and a mobile terminal in the first embodiment;

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Fig. 5 is a flow diagram illustrating an

admission process which involves a plurality of mobile terminals in the first embodiment;

Fig. 6 is a block diagram illustrating a network topology in the first embodiment;

5 Fig. 7 is a block diagram illustrating an automatic vending machine according to a second embodiment of the present invention;

Fig. 8 is a block diagram illustrating a ticket vending machine according to a third embodiment  
10 of the present invention; and

Fig. 9 is a block diagram illustrating a conventional ticket examiner.

#### DETAILED DESCRIPTION OF THE EMBODIMENTS

A first embodiment of the present invention  
15 is illustrated in Figs. 1 and 6. In Fig. 1, a ticket examiner 1 comprises a magnetic head 2; a printer 3; a slot and a paper handler 41; a paper handler and a pickup port 42; a collector box 5; a controller 6; an optical sensor based light receiver 7; a light source  
20 71; and motor driven gates 81, 82. A non-contact communication means 9 comprises a baseband control circuit and RF 91; an antenna 92; a stocker 10; and a trimmer 11.

The motor driven gates 81, 82 may be  
25 installed remotely from the ticket examiner 1, in which case the motor driven gates 81, 82 may be connected to the ticket examiner 1 through a network or the like.

It is also contemplated that a plurality of ticket examiners 1 are installed in parallel to define passages for spectators. In the later case, the motor driven gates 81, 82 are shared by two ticket examiners

5 1. For opening and closing the motor driven gates 81, 82 when they are shared, one of the ticket examiners 1 may transmit a signal for opening and closing the gates to the other ticket examiner 1.

The ticket examiner 1 serves to permit a  
10 service provider to provide a service by managing entry and exit to and from a site in which a service is provided.

In the following, a method of permitting the provision of a service will be described in a specific  
15 manner.

As a spectator, who carries a mobile terminal having an electronic ticket stored therein, approaches the ticket examiner 1, a communication link is established between a non-contact communication means  
20 of the mobile terminal and the non-contact communication means 9 of the ticket examiner 1. Any conventional wireless communication techniques may be employed for establishing the link. Alternatively, the link may be established by the respective communication  
25 means which make communications where each of the communication means act as a master of the communications to the other party.

As the link is established, the ticket



examiner 1 sends audio data for forcing the mobile terminal to make an aural guidance, or a command for specifying audio data stored in the mobile terminal and instructing the mobile terminal to output the specified  
5 audio data. Upon receipt of the command transferred thereto, the mobile terminal outputs a voice based on the sent audio data or the audio data specified by the command. The user who carries the mobile terminal is prompted to gradually approach and pass through the  
10 ticket examiner 1 for admission, guided by the voice outputted from the mobile terminal. In this way, the aural guidance is implemented. The voice outputted from the mobile terminal may be mechanically synthesized one or a recorded natural voice of the user  
15 or a third person. Alternatively, the aural guidance may be replaced with a text or image based guidance, or the guidance function itself may even be omitted.

After the link has been established, the ticket examiner 1 acquires information on an electronic  
20 ticket from the mobile terminal. The ticket examiner 1 refers to a center through the network for the acquired information on the electronic ticket. Upon confirmation of a valid ticket as a result of the reference, the controller 6 of the ticket examiner 1  
25 generates printing data and data to be magnetically recorded as preparation for issuing a ticket, and stores the data in the controller 6. The preparation for issuing the ticket is made independently of the

admission control at any time for each mobile terminal which has established a link with the ticket examiner 1.

As the spectator enters the ticket examiner 1 in accordance with the aural guidance, the optical sensor 7 senses the spectator passing through the ticket examiner 1. The ticket examiner 1, which has sensed the spectator passing therethrough, proceeds to a process for identifying the spectator and the mobile terminal.

The ticket examiner 1 attempts to call a mobile terminal near the ticket examiner 1 using the non-contact communication means 9. If a ticket is introduced through the slot 41 while a call is being made, the ticket examiner 1 stops calling. As the spectator goes forward on, the ticket examiner 1 continues to call on the assumption that the spectator will not introduce a ticket.

At the time the ticket examiner 1 receives a response to the call from the mobile terminal, the ticket examiner 1 sends the previously prepared printing data and data to be magnetically recorded to the printer 3 and the magnetic head 2, respectively. The stocker 10 stores slips for displaying the certificate of granted admission, for example, slips coated with a magnetic material. A given number of such slips coated with a magnetic material are delivered from the stocker 10, shaped by the trimmer

11, and then sent to the magnetic head 2. The magnetic head 2 writes magnetic data onto the slips sent thereto. The printer 3 prints characters on the front and back sides of each slip, onto which the magnetic data has been written, based on the printing data, and punches out the slips. The paper handler 42 delivers the slips processed by the printer 3 to the pickup port.

After the printer 3 has printed data, the controller 6 of the ticket examiner 1 opens the motor driven gate 82 and permits the spectator to pass therethrough.

In this embodiment, electronic tickets are stored in a mobile terminal which actively operates. Alternatively, the ticket examiner 1 of this embodiment may be used as well when electronic tickets are stored on a medium, as represented by a non-contact IC card, which passively operates.

As the ticket examiner 1 senses that a spectator carrying a non-contact IC card has entered the gate of the ticket examiner 1, electric waves are irradiated from the non-contact communication means 9. The spectator carrying the non-contact IC card faces the non-contact IC card to the non-contact communication means 9. In this event, the power of the electric waves irradiated from the non-contact communication means 9 activates the non-contact IC card. The activated non-contact IC card transmits

information on an electronic ticket stored therein, multiplexed on the electric waves, to the ticket examiner 1. Then, the non-contact communication means 9 receives the multiplexed electric waves.

5                   Subsequently, a process for issuing a ticket is performed through verification and so on, as is the case with the mobile terminal.

Fig. 2 illustrates an outer appearance of the ticket examiner 1 according to this embodiment. As can  
10 be seen, the motor driven gates 81, 82 are not illustrated. The antenna 92 of the non-contact communication means 9 is comprised of two antennas 92a, 92b. The antenna 92a is mounted at a position at which communications between the ticket examiner 1 and a  
15 mobile terminal are blocked as less frequently as possible, for example, at a location on the top surface or on the front surface of the ticket examiner 1. The antenna 92b is mounted on a side surface which faces a passage through which spectators pass through the  
20 ticket examiner 1. The ticket examiner 1 establishes a link with a mobile terminal of a spectator through the antenna 92a. The ticket examiner 1 identifies a spectator using the antenna 92b.

Fig. 3 shows a wave accessible/audible range  
25 of the non-contact communication means 9 in this embodiment. In the figure, the ticket examiner 1 defines a passage for spectators to pass together with a component 30. In this event, the component 30 may be

a plate fixed in parallel with the ticket examiner 1, or another ticket examiner which has similar functions to the ticket examiner 1. In this embodiment, the component 30 is assumed to have no functions of the ticket examiner.

In this embodiment, a wave accessible range, corresponding to input/output sensitivities of the baseband control circuit and RF 91 of the non-contact communication means 9, is substantially equal to an audible range. In Fig. 3, wave accessible/audible ranges associated with the antennae 92a, 92b are designated by 101a, 101b, respectively. The wave accessible/audible range 101a extends over a radius of 10 meters centered at the ticket examiner 1, while the wave accessible/audible range 101b extends over a radius of one meter centered at the ticket examiner 1.

Fig. 4 shows a relationship between the wave accessible/audible range of the non-contact communication means 9 and a mobile terminal in this embodiment. In Fig. 4, 102a, 102b, 102c indicate the positions of mobile terminals carried by spectators. Therefore, the positions 102a, 102b, 102c are essentially equivalent to the positions of the spectators. The position 102a indicates a position when the spectator goes forward into the wave accessible/audible range 101a of the ticket examiner 1. Subsequently, as long as the mobile terminal of the spectator lies within the wave accessible/audible range

101a, the ticket examiner 1 maintains a link established with the mobile terminal of the spectator.

In the following, description will be made on a positional relationship between the wave

5 accessible/audible range and a spectator.

A spectator, who has entered the wave accessible/audible range 101a of the ticket examiner 1 at the position 102a, is prompted by the aural guidance to approach the ticket examiner 1. The ticket examiner 10 1 starts calling in the wave accessible/audible range 101b in preparation for the passage of the spectator. As the spectator reaches the position 102b, a mobile terminal carried by the spectator responds to the call from the ticket examiner 1. With this response, the 15 ticket examiner 1 identifies the spectator and issues a ticket. The spectator, who has received the issued ticket, passes through the passage defined by the ticket examiner 1 and the plate 30, and goes out of the wave accessible/audible range 101a of the ticket 20 examiner 1 at the position 102c. The ticket examiner 1 instructs the mobile terminal to discard or invalidate the electronic ticket stored in the mobile terminal, while the spectator moves from the position 102b to 102c.

25 Fig. 5 illustrates operations involved in the admission of a plurality of spectators in this embodiment. While Fig. 5 shows three mobile terminals, the number of mobile terminals, i.e., the number of

spectators, which can be processed at one time by the ticket examiner 1 depends on inherent identifiers such as addresses, and a particular protocol. Therefore, a larger number of spectators can be collectively  
5 processed if required.

Fig. 5 illustrates processes in communications between the mobile terminals and the ticket examiner 1 and processes in the respective apparatus in a time series format. Assume that a link  
10 has been previously established between a first mobile terminal and the ticket examiner 1.

As a second mobile terminal enters the wave accessible/audible range of the ticket examiner 1, the ticket examiner 1 searches for the second mobile  
15 terminal and calls the second mobile terminal. A link is established therebetween when the second mobile terminal responds to the call. In this event, an identifier and synchronization clock information given to the second mobile terminal upon establishment of the  
20 link is transferred from the ticket examiner 1 to the second mobile terminal. In response, the second mobile terminal synchronizes its clock to that of the ticket examiner 1, and responds to the ticket examiner 1 to that effect. The response from the mobile terminal  
25 includes information on an electronic ticket and so on. Through a sequence of communications, the ticket examiner 1 successfully calls the second mobile terminal. In response, the ticket examiner 1 prepares

for permitting the provision of a service for the second mobile terminal.

In preparation for permitting the provision of a service, the ticket examiner 1 refers to the center through the network for the acquired information on the electronic ticket. Upon confirmation of a valid ticket as a result of the reference, the ticket examiner 1 generates printing data and data to be magnetically recorded as preparation for issuing a ticket.

In a similar procedure, the ticket examiner 1 calls a third mobile terminal, and prepares for permitting the provision of a service.

When calls from mobile terminals are temporarily depleted, or when a previously determined time period has elapsed through a timer interruption or the like, the ticket examiner 1 confirms, using the antenna 92b, whether or not any mobile terminal is close to the ticket examiner 1, e.g., within a radius of one meter from the antenna 92b in this embodiment (hereinafter referred to as "sense"). If a spectator passes across the optical sensor 8, the spectator is unconditionally sensed.

The ticket examiner 1 first requests the first mobile terminal for a ticket through the antenna 92b. Supposing that the first mobile terminal does not exist near the ticket examiner 1, the first mobile terminal does not receive the request for a ticket, and



5 In continuation, the ticket examiner 1 requests the second mobile terminal for a ticket. Suppose that the second mobile terminal does not either exist near the ticket examiner 1. Thus, the ticket examiner 1 receives no response from the second mobile  
0 terminal, thereby recognizing that the second mobile terminal does not exist nearby.

The ticket examiner 1, when recognizing that the third mobile terminal exists nearby, determines that the third mobile terminal is a terminal carried by a spectator who has passed across the optical sensor 8 at any time before or after the recognition, and performs the operation involved in issuing a ticket.

25           Upon completion of the issuance of a ticket,  
the ticket examiner 1 requests the third mobile  
terminal to discard an associated electronic ticket  
stored therein. In response, the third mobile terminal

discards or invalidates the electronic ticket, and notifies the ticket examiner 1 to that effect. The ticket examiner 1 completes a sequence of the ticket examination processing by receiving a response from the  
5 third mobile terminal. Upon completion of the ticket examination processing, the ticket examiner 1 disconnects the link with the third mobile terminal. Subsequently, the ticket examiner 1 starts calling another mobile terminal through the antenna 92b.

10 Fig. 6 illustrates the network topology in this embodiment. The network topology comprises a network 13; an information processing apparatus 14a in a bank which makes settlements; an information processing apparatus 14b in a credit company or the  
15 like; an information processing apparatus 14c in a service provider; a computer and network connector 141 of the information processing apparatus; and a storage 142.

The ticket examiner 1 in the figure refers to  
20 the information processing apparatus 14c in the service provider for an electronic ticket by sending data transmitted thereto from a mobile terminal. The information processing apparatus 14c in the service provider determines based on the transmitted data  
25 whether or not the electronic ticket is valid. When the ticket examiner 1 terminates the provision of a service or issues a ticket for permitting the provision of a service, the ticket examiner 1 notifies the

information processing apparatus 14c in the service provider, through the network 13, that the electronic ticket has been used. The information processing apparatus 14c in the service provider, upon receipt of  
5 the notification, adds data to a record corresponding to the ticket in the storage 142, indicating that the ticket has been used.

Depending on general contractual conditions at the time the electronic ticket was reserved, a price  
10 may be paid by a variety of media such as advance payment, debit, installment, credit and so on. The network of this embodiment can support any of these media. For advance payment or electronic debit, a settlement is made in a clearing bank at the time the  
15 electronic ticket is sold. For installment or credit, an associated credit company or the like is notified of the amount due at the time data indicative of used ticket is added to a record associated with the ticket in the storage 142, so that a settlement is made  
20 between a service provider and the credit company.

Fig. 7 illustrates a second embodiment of the present invention. An automatic vending machine 19 illustrated in Fig. 7 comprises a refrigerator and heater 15; a catch pan 16 of a take-out port; a liquid  
25 crystal display 17 equipped with a touch panel which functions as a display and a selector; and a cash transfer unit 18 for confirming and counting bills and coins and delivering changes.

When the automatic vending machine 19 is installed for selling canned juice, for example, the stocker 10 stores articles, i.e., canned juice, and the refrigerator and heater 15 cool or heat the stocker 10 to keep the stored canned juice at an appropriate temperature.

A method of providing a service in the second embodiment will be described below.

As a purchaser, carrying a mobile terminal, approaches the automatic vending machine 19, the automatic vending machine 19 senses that a person is approaching by means of an optical sensor, heat sensor based on infrared sensing 8. Subsequently, the automatic vending machine 19 calls the mobile terminal using a non-contact communication means 9 to establish a link with the mobile terminal of the purchaser. In the second embodiment, the number of links established at one time in the automatic vending machine 19 is limited to one. The mobile terminal, following a request for a ticket from the automatic vending machine 19, responds with compensation information which guarantees a price to be paid for a provided service, such as electronic money, credit card number, electronic ticket, customer number or the like.

The customer number is a number given to a purchaser who has been previously registered by the service provider. When the purchaser utilizes a service through the customer number, a settlement is

made based on general contractual conditions arranged between the service provider and the purchaser.

The automatic vending machine 19 refers to the center for the compensation information by transmitting the acquired compensation information to the center. The center determines the validity of the compensation information, and returns the result to the automatic vending machine 19. The automatic vending machine 19 confirms based on the returned result that the compensation information is valid and that there is a remainder more than a price for a provided service, and proceeds to a process for providing a service.

The automatic vending machine 19, which has proceeded to the service providing process, arranges and displays available articles on the display and selector 17, and waits for the purchaser to select an article. As the purchaser touches a particular position on the display and selector 17, the automatic vending machine 19 knows which article has been selected, causing an extractor 43 to transport the selected article from the stocker 10 to the catch pan 16 of the take-out port.

At this time, the automatic vending machine 19 notifies the center that the sale of the article is completed, requests for a settlement, and informs details on articles stored in the stocker 10.

Also, when the electronic money or the like is utilized, the amount larger than a price for a

provided service may be electronically paid. The purchaser pays a surplus amount of money by specifying a price to be paid in addition to the electronic money when he is inquired by the automatic vending machine

5 19.

When a surplus amount of money is paid, the automatic vending machine 19 refunds the surplus money when the purchaser pushes down a refund lever after receiving an article. The refund can also be carried

10 out electronically through communications, provided that a link remains established between the automatic vending machine 19 and the mobile terminal.

Alternatively, the refund may be made upon a request for disconnecting the link from the mobile terminal, or

15 inadvertent disconnection of the link.

As the link between the automatic vending machine 19 and the mobile terminal is disconnected, the automatic vending machine 19 turns off illumination for the display and selector 17 or prevents any article

20 from being delivered, and pays out cash from the cash transfer unit 18. The cash transfer unit 18 notifies the center of the numbers of bills and coins stored therein each time it transfers cash.

Fig. 8 illustrates a third embodiment of the present invention. Specifically, Fig. 8 illustrates an

25 automatic ticket vending machine 20 according to the present invention.

The automatic ticket vending machine 20 may

be such one that may be found, for example, in a station, beside a check-in counter in an airport, or in an amusement park for selling tickets for an attraction.

5           .     As a purchaser, carrying a mobile terminal, approaches the automatic ticket vending machine 20, the automatic ticket vending machine 20 senses that a person is approaching by means of an optical sensor 8. In continuation, the automatic ticket vending machine  
10 20 calls the mobile terminal using a non-contact communication means 9 to establish a communication link with the mobile terminal of the purchaser. In the third embodiment, the number of links established at one time in the automatic ticket vending machine 20 is  
15 limited to one. The mobile terminal, following a request for a ticket from the automatic ticket vending machine 20, transfers guarantee information to the automatic vending machine 20 for guaranteeing a price to be paid for a provided service, such as electronic  
20 money, credit card number, electronic ticket, customer number or the like.

          The automatic ticket vending machine 20 refers to the center for the compensation information by transmitting the acquired guarantee information to  
25 the center. The center determines the validity of the guarantee information, and returns the result to the automatic ticket vending machine 20. The automatic ticket vending machine 20 confirms based on the





electronically, the automatic ticket vending machine 20  
refunds the surplus money when the purchaser pushes  
down a refund lever after receiving an article. The  
refund can also be carried out with electronic money  
5 through communications, provided that a link remains  
established between the automatic vending machine 20  
and the mobile terminal. Alternatively, the refund may  
be made upon a request for disconnecting the link from  
the mobile terminal, or inadvertent disconnection of  
10 the link. As the link between the automatic ticket  
vending machine 20 and the mobile terminal is  
disconnected, the automatic ticket vending machine 20  
turns off illumination for the display and selector 17  
or prevents any article from being delivered, and pays  
15 out cash from a cash transfer unit 18. The cash  
transfer unit 18 notifies the center of the numbers of  
bills and coins stored therein each time it transfers  
cash.

The present invention can advantageously  
20 provide the user with a service in a simple and rapid  
way, making use of information which certifies a  
compensation such as an electronic ticket stored in a  
mobile terminal.

Also, the present invention can conveniently  
25 and reliably provide a service contracted through an  
electronic settlement to the user who should receive  
the service only among three parties which include an  
electronic ticket stored in a mobile terminal as a

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